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METHYL BROMIDE FUMIGATION OF THE WHITE-FRINGED BEETLE LARVA IN SMALL FLOWERPOTS IN NEW ORLEANS

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The discovery of the white-fringed beetle (Pantomorus leucoloma (Boh.) in New Orleans in the latter part of 1937, and the subsequent promulgation of quarantines by the State of Louisiana and by the Federal Government, under which plant material with soil attached to the roots was not permitted to move from the infested area, made it necessary that experimental work be undertaken to provide means of disinfesting soil masses. The object of the work reported in this paper was to determine the optimum methyl bromide fumigation treatment that might be used with safety on plants grown in this area and to determine the maximum size of flowerpot in the soil of which the treatment would produce complete mortality of white-fringed beetle larvae.

Method and Procedure

The insect larvae were collected from infested areas covered with Johnson grass and other weeds in New Orleans and vicinity. These were placed in flowerpots of potting soil composed of approximately equal parts of brown river silt, well-rotted cow manure, swamp leafmold, and sand or sandy loam; at the same time wheat or peanuts, sometimes both, were planted in the pots, and when the plants had produced a root system sufficient to bind the soil into a compact mass, they were used in testing the lethal effect of the fumigant on the larvae. The compact mass of soil bound together by the roots simulated the conditions found in pots in which nursery stock is growing. Twenty-four hours after the fumigation the larvae were removed from the soil masses and placed on the surface of moist sand. If they burrowed into the sand, they were counted as having survived the treatment; if unable to do so, they were regarded as having been killed by it.

The experimental fumigation equipment consisted of a tight metal-lined chamber containing 25 cubic feet of space. The walls were well insulated with bagasse board. In the chamber was a fan for circulating the fumigant and an electric heater operated automatically through a thermostat for control of the temperature during the fumigation treatment.

In actual operation the desired number of infested pots of various sizes were placed in the fumigation chamber along with a selection of plants being tested for their ability to withstand the treatment. The heater was then turned on and allowed to operate automatically, a temperature of 85° F. or slightly above being maintained in all the experiments. Sufficient time was allowed for the soil masses in the pots to reach these temperatures

before the fumigant was introduced. In the chamber the heat was distributed evenly by a continuously operated fan, run at a low speed to avoid wind damage to the plants, throughout the duration of the prefumigating-heating period and during the fumigation exposure. When the temperature of the soil had reached 85° F., the liquid methyl bromide was introduced and the fumigation exposure was measured from this time. The precooled fumigant (about 99.5 percent pure) was measured in a small graduated cylinder and introduced (in the liquid state) through a small opening in the top of the fumigation chamber.

Experimental Results

In a number of preliminary experiments various concentrations of methyl bromide and periods of exposure were tested for lethality to the larvae of the white-fringed beetle and to many species of plants. From these experiments it seemed evident that the least damage to the plants of this area occurred when the concentration of the fumigant was low and the period of exposure long, whereas high concentrations and short exposures appeared to cause greater damage to plants or gave incomplete mortality of larvae. Certain species of plants were more tolerant to the gas than others. It appeared that a dosage of 1 pound of methyl bromide to each 1,000 cubic feet of space in the chamber and an exposure of 4 hours caused least injury in general to plant life, and it was decided to determine what was the largest sized pot of soil in which this dosage and exposure at 85° F. and slightly above would give a complete mortality of test insects.

In table 1 are given the results obtained when the above treatment was applied to flowerpots 2-1/4, 2-1/2, 3, and 4 inches in size. The soil was usually no more than medium wet and never soggy or muddy.

The data given in table 1 show that a complete mortality of larvae in 2-1/4-, 2-1/2-, and 3-inch flowerpots was obtained. The mortality in 4-inch pots was incomplete and averaged 95.1 percent. It is of interest to point out that the volume of the 2-1/4-inch pot is 108 cc., the 2-1/2-inch pot 120 cc., and the 3-inch pot 215 cc., whereas that of the 4-inch pot is 500 cc., which is 2.3 times as great as the volume of the 3-inch pot.

Since the determination that larvae in the soil of 3-inch and smaller flowerpots were killed by fumigation with methyl bromide at a dosage of 1 pound for 4 hours at 85° F. or slightly above, nurseries in New Orleans and vicinity have fumigated an estimated 40 thousand plants, with the aid and supervision of the Louisiana State Department of Agriculture and Immigration and the Division of Domestic Plant Quarantines of the United States Bureau of Entomology and Plant Quarantine. Not all species and varieties of plants grown commercially in New Orleans will tolerate this treatment, but about 90 percent will tolerate it without noticeable damage or serious retardation. Experimental work and

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experience in commercial work have shown that susceptible plants suffer less damage when growth is not active and that newly transplanted rooted cuttings and seedling plants should not be fumigated until well established. It follows, therefore, that the tolerance of some plants in the climate of New Orleans to the treatment varies not only with the species and variety but with certain somewhat intangible conditions of growth.

Whether or not the larvae of the white-fringed beetle and the plants in other areas where the beetle is known to occur show the same tolerance to methyl bromide fumigation that they do in the New Orleans area has not been determined.

Table 1.—Mortality caused by methyl bromide fumigation to larvae of the white-fringed beetle in flowerpots from 2-1/4 to 4 inches in size, with 1 pound of fumigant to each 1,000 cubic feet of chamber space, for 4 hours at temperatures of 85° F. or slightly above. New Orleans, La.

Series No.	Number of flowerpots	Number of larvae recovered after fumigation	Mortality of larvae	
			Number killed	Percent killed
		Larvae in 2-1/4-inch flowerpots		
1	13	43	43	100.0
2	2	4	4	100.0
3	8	28	28	100.0
4	6	20	20	100.0
5	9	31	31	100.0
6	1	5	5	100.0
7	1	4	4	100.0
8	2	6	6	100.0
Total or average	42	141	141	100.0
		Larvae in 2-1/2-inch flowerpots		
9	8	34	34	100.0
10	3	13	13	100.0
11	7	31	31	100.0
12	6	19	19	100.0
13	10	43	43	100.0
14	1	2	2	100.0
15	3	9	9	100.0
Total or average	38	151	151	100.0

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Table 1.--continued

Series No.	Number of flowerpots	Number of larvae recovered after fumigation	Mortality of larvae	
			Number killed	Percent killed
		Larvae in 3-inch flowerpots		
16	6	27	27	100.0
17	3	12	12	100.0
18	7	26	26	100.0
19	5	22	22	100.0
20	10	45	45	100.0
21	1	4	4	100.0
22	1	4	4	100.0
23	3	11	11	100.0
24	50	211	211	100.0
25	18	76	76	100.0
26	70	295	295	100.0
27	46	190	190	100.0
Total or average	220	923	923	100.0
		Larvae in 4-inch flowerpots		
28	6	56	56	100.0
29	1	4	4	100.0
30	6	51	47	92.1
31	6	47	45	95.7
32	6	38	29	76.3
33	1	7	7	100.0
34	1	6	6	100.0
35	1	2	2	100.0
36	29	237	225	94.9
37	27	209	209	100.0
38	31	267	250	93.6
Total or average	115	924	880	95.1

Summary

Fumigation of the larva of the white-fringed beetle (Pantomorus leucoloma (Boh.) in New Orleans with methyl bromide at a dosage of 1 pound to each 1,000 cubic feet of chamber space for a period of 4 hours at a temperature of 85° F. or averaging closely above that point, destroyed infestations in the soil about the roots of plants growing in 3-inch or smaller flowerpots, but not in 4-inch pots. The volume of the 4-inch pot is 2.3 times as great as that of the 3-inch pot. The treatment has been used successfully in quarantine work in New Orleans and is tolerated by approximately 90 percent of the plant species and varieties.

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